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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
SUN, XIUQIN	

ART UNIT	PAPER NUMBER
2863	

DATE MAILED: 03/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/776,321	ELDRIDGE, MARK F.	
	Examiner	Art Unit	
	Xiuqin Sun	2863	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-57* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,25-29,31-39,42-45,51-54,56 and 57* is/are rejected.

7)☒ Claim(s) *4-24,30,40,41,46-50 and 55* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *02/12/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objection

1. Claims 45-51 are objected to because of the following minor informalities:

Claims 45-51, lines 1 and 2, please change "wherein the wherein" into -- wherein-- in each of the claims, respectively.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 28 and 29 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01.

Claims 28 and 29 recite the limitation "the flow bridge signal". There is insufficient antecedent basis for this limitation in the claims.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 25-29, 31, 33-36, 39, 42 and 43 are rejected under 35 U.S.C. 102(b) as being anticipated by Bonne et al. (U.S. Pat. No. 5237523).

Bonne et al. teach a thermal mass flowmeter comprising: means for providing a flow ratio signal and a temperature ratio signal (col. 4, lines 5-21, lines 29-34); means for applying an overheat factor to the flow ratio signal or the temperature ratio signal (col. 2, lines 4-44; cols. 4-5, lines 68-27 and col. 6, lines 26-34); means for applying a temperature correction factor to the flow ratio signal or the temperature ratio signal (col. 2, lines 4-44; cols. 4-5, lines 68-27 and col. 6, lines 26-34); and means for balancing the flow ratio signal and temperature ratio signal, wherein the temperature correction factor is determined by a predefined function of a temperature of a fluid (col. 2, lines 45-58 and col. 4, lines 59-65). The teaching of Bonne et al. further includes: said means for balancing the flow ratio signal and the temperature ratio signal comprises means for applying a predetermined gas compensation factor to the flow ratio signal or the temperature ratio signal (col. 2, lines 45-58 and col. 4, lines 59-65); the temperature ratio signal is a substantially linear function of the temperature of the fluid (col. 5, lines

9-27); means for converting the temperature ratio signal for providing a temperature signal (col: 5, lines 9-27).

Bonne et al. further teach a method of calibrating a thermal mass flowmeter, the method comprising the steps of: sequentially operating the flowmeter with a fluid at two or more predetermined temperatures and at a predetermine fluid flow rate (col. 6, lines 5-10 and lines 25-39); determining respective values of a temperature calibration factor at each temperature (cols. 4-5, lines 68-27 and col. 6, lines 26-53); and determining parameters of a function using the respective values of the temperature calibration factor and values of the temperature, wherein the function defines a relationship between the temperature of the fluid and a temperature correction factor (col. 6, lines 40-63). The teaching of Bonne et al. further includes the steps of: balancing a flow ratio signal and a temperature ratio signal at each temperature using the respective temperature calibration factor (col. 2, lines 45-58 and col. 4, lines 59-65); applying the respective temperature calibration factor to the flow ratio signal or the temperature ratio signal (cols. 4-5, lines 68-27 and col. 6, lines 26-63); applying an overheat factor to the flow ratio signal or the temperature ratio signal (cols. 4-5, lines 68-27 and col. 6, lines 26-63); adjusting the flow signal or temperature signal using a gas compensation factor (col. 2, lines 45-58 and col. 4, lines 59-65); determining the values of the temperature using a temperature sensor signal (col. 4, lines 5-21, lines 29-34); sequentially operating the thermal mass flowmeter with the fluid at two or more predetermined temperatures (col. 6, lines 5-10 and lines 25-39); determining a value of a respective bridge signal at each temperature (cols. 4-5, lines 68-27 and col. 6, lines 26-53); and

determining a amount of error between two different values of the bridge signal (Figs. 3 and 4); and determining if the amount of error is less than a predetermined value (cols. 6-7, lines 67-4).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 2, 3, 37 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bonne et al. (U.S. Pat. No. 5237523) in view of Gee (U.S. Pub. No. 20030212510).

Bonne et al. teach the thermal mass flowmeter that includes the subject matter discussed above. Bonne et al. do not mention explicitly: the flow ratio signal and the temperature ratio signal comprises: a bridge thermally connectable to the fluid; a signal conditioner for conditioning signals from the bridge to provide a flow sensor signal, a flow bridge signal, a temperature sensor signal and a temperature bridge signal; and means for dividing the flow sensor signal by the flow bridge signal and means to divide the temperature sensor signal by the temperature bridge signal to provide the flow ratio signal and temperature ratio signal respectively, wherein the bridge is a Wheatstone bridge.

Gee teaches a mass flowmeter, including a flow ratio signal and a temperature ratio signal which comprise: a bridge thermally connectable to the fluid; a signal conditioner for conditioning signals from the bridge to provide a flow sensor signal, a flow bridge signal, a temperature sensor signal and a temperature bridge signal; and means for dividing the flow sensor signal by the flow bridge signal and means to divide the temperature sensor signal by the temperature bridge signal to provide the flow ratio signal and temperature ratio signal respectively, wherein the bridge is a Wheatstone bridge (sections 0009 and 0029-0035).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to include the teaching of Gee in the invention of Bonne et al. in order to provide a self-consistent mechanism for configuring the thermal-type mass flowmeter to generate a temperature compensated flow measurement (Gee, section 0008).

8. Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bonne et al. (U.S. Pat. No. 5237523) in view of Citron (U.S. Pat. No. 4807151).

Bonne et al. teach a method of calibrating a thermal flowmeter that includes the subject matter discussed above. Bonne et al. do not mention explicitly: the step of sequentially operating the flowmeter comprises a step of sequentially operating the flowmeter with a fluid at two or more predetermined temperatures and at a no-flow fluid rate.

Citron teaches a bridge-type mass flowmeter, including a steady-state model in which the flowmeter is sequentially operated with a fluid at different predetermined

temperatures and at a no-flow fluid rate (col. 4, lines 63; col. 5, lines 1-6; col. 6, lines 1-10 and col. 11, lines 46-59).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to include the teaching of Citron in the invention of Bonne et al. in order to provide a mechanism for understanding how various outside factors such as variations in temperature affect the operation of the device (Citron, col. 4, lines 63-67).

9. Claims 44, 45, 51, 52, 54 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bonne et al. (U.S. Pat. No. 5237523) in view of Gee (U.S. Pub. No. 20030212510).

Bonne et al. teach a method for determining a flow rate of a fluid comprising the steps of: applying an overheat factor to a flow sensor signal or a temperature sensor signal (col. 2, lines 4-44; cols. 4-5, lines 68-27 and col. 6, lines 26-34); applying a temperature correction factor determined by a predefined function of a temperature of the fluid to the flow sensor signal or the temperature sensor signal (col. 2, lines 4-44; cols. 4-5, lines 68-27 and col. 6, lines 26-34); and balancing the flow sensor signal and the temperature sensor signal (col. 2, lines 45-58 and col. 4, lines 59-65). The teaching of Bonne et al. further includes: adjusting the flow signal or the temperature signal by a predetermined gas compensation factor (col. 2, lines 45-58 and col. 4, lines 59-65); determining the temperature of the fluid using the temperature sensor signal (col. 4, lines 5-21, lines 29-34).

Bonne et al. do not mention explicitly: thermally connecting a bridge to the fluid; conditioning signals from the bridge using a signal conditioner to provide a flow sensor

signal and a temperature sensor signal; said step of balancing includes providing a bridge signal to the bridge; determining the temperature of the fluid using a ratio of the temperature sensor signal and a temperature bridge signal; determining the flow rate using the bridge signal; and said bridge is a Wheatstone bridge.

Gee teaches a method for determining a flow rate of a fluid, including: thermally connecting a bridge to the fluid; conditioning signals from the bridge using a signal conditioner to provide a flow sensor signal and a temperature sensor signal; and balancing the flow sensor signal and the temperature sensor signal by providing a bridge signal to the bridge, wherein the bridge is a Wheatstone bridge (sections 0009 and 0029-0035); determining the temperature of the fluid using a ratio of the temperature sensor signal and a temperature bridge signal (sections 0029-0035); determining the flow rate using the bridge signal (section 0009); and said bridge is a Wheatstone bridge (sections 0009 and 0029-0035).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to include the teaching of Gee in the invention of Bonne et al. in order to provide a self-consistent mechanism for configuring the thermal-type mass flowmeter to generate a temperature compensated flow measurement (Gee, section 0008).

10. Claims 53 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bonne et al. (U.S. Pat. No. 5237523) in view of Gee (U.S. Pub. No. 20030212510), as applied to claim 44 above, and further in view of Suzuki (U.S. Pat. No. 6230560).

Bonne et al. and Gee teach a method for determining a flow rate of a fluid that includes the subject matter discussed above. The combination of Bonne et al. and Gee does not mention explicitly: determining the temperature of the fluid using a thermometer.

Suzuki teaches a flow measuring device and flow measuring method, including the step and means for determining the temperature of the fluid using a thermometer (col. 20, lines 32-67 and col. 21, lines 1-19).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to include the teaching of Suzuki in the combination of Bonne et al. and Gee as a conventional and low-cost approach to accurately measure the temperature of a fluid (Suzuki, col. 20, lines 32-67 and col. 21, lines 1-19).

Allowable Subject Matter

11. Claims 4-24, 30, 40-41, 46-50 and 55 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Reasons for Allowance

12. The following is an examiner's statement of reasons for allowance:
The primary reason for the allowance of claims 4 and 7-19 is the inclusion of the limitations that a flow reference impedance and a flow sensor resistance temperature detector (RTD) for dividing a bridge signal according to a relative impedance of the flow

reference impedance and the flow sensor RTD; and a temperature reference impedance and a temperature sensor RTD for dividing the bridge signal according to a relative impedance of the temperature reference impedance and the temperature sensor RTD. It is these limitations found in each of the claims, as they are claimed in the combination that have not been found, taught or suggested by the prior art of record, which make these claims allowable over the prior art.

The primary reason for the allowance of claims 5, 6 and 20-23 is the inclusion of the limitations that a flow reference impedance and a flow sensor resistance temperature detector (RTD) for dividing a bridge signal according to a relative impedance of the flow reference impedance and the flow sensor RTD; and a thermometer for determining the temperature of the fluid and providing a temperature signal. It is these limitations found in each of the claims, as they are claimed in the combination that have not been found, taught or suggested by the prior art of record, which make these claims allowable over the prior art.

The primary reason for the allowance of claim 24 is the inclusion of the limitation that the means for balancing the flow ratio signal and the temperature ratio signal comprises means for substituting a predefined virtual temperature signal for the temperature ratio signal. It is this limitation found in the claim, as it is claimed in the combination that has not been found, taught or suggested by the prior art of record, which makes this claim allowable over the prior art.

The primary reason for the allowance of claim 30 is the inclusion of the limitation that a type of the predefined function is chosen from a list consisting of linear, quadratic,

cubic, and piece-wise linear. It is this limitation found in the claim, as it is claimed in the combination that has not been found, taught or suggested by the prior art of record, which makes this claim allowable over the prior art.

The primary reason for the allowance of claim 40 is the inclusion of the limitation that the step of determining parameters of a function comprises a step of curve fitting a polynomial using a least-squares method to the values of the temperature calibration factor. It is this limitation found in the claim, as it is claimed in the combination that has not been found, taught or suggested by the prior art of record, which makes this claim allowable over the prior art.

The primary reason for the allowance of claim 41 is the inclusion of the limitation that the step of determining parameters of a function comprises a step of fitting a piece-wise linear function to the values of the temperature calibration factor. It is this limitation found in the claim, as it is claimed in the combination that has not been found, taught or suggested by the prior art of record, which makes this claim allowable over the prior art.

The primary reason for the allowance of claims 46 and 55 is the inclusion of the limitation that the step of conditioning signals using a signal conditioner comprises steps of canceling losses in a three-wire connection and providing a flow bridge signal and the flow sensor signal. It is this limitation found in each of the claims, as it is claimed in the combination that has not been found, taught or suggested by the prior art of record, which makes these claims allowable over the prior art.

The primary reason for the allowance of claim 47 is the inclusion of the limitation that the step of conditioning signals using a signal conditioner comprises steps of canceling losses in a three-wire connection and providing a temperature bridge signal and the temperature sensor signal. It is this limitation found in the claim, as it is claimed in the combination that has not been found, taught or suggested by the prior art of record, which makes this claim allowable over the prior art.

The primary reason for the allowance of claim 48 is the inclusion of the limitation that the step of conditioning signals using a signal conditioner comprises steps of canceling losses in a four-wire connection and providing a flow bridge signal and a flow sensor signal. It is this limitation found in the claim, as it is claimed in the combination that has not been found, taught or suggested by the prior art of record, which makes this claim allowable over the prior art.

The primary reason for the allowance of claim 49 is the inclusion of the limitation that the step of conditioning signals using a signal conditioner comprises steps of canceling loses in a four-wire connection and providing a temperature bridge signal and a temperature sensor signal. It is this limitation found in the claim, as it is claimed in the combination that has not been found, taught or suggested by the prior art of record, which makes this claim allowable over the prior art.

The primary reason for the allowance of claim 50 is the inclusion of the limitation that the step of balancing the flow sensor signal and the temperature sensor signal circuit comprises a step of substituting a predefined virtual temperature signal for the temperature sensor signal. It is this limitation found in the claim, as it is claimed in the

combination that has not been found, taught or suggested by the prior art of record, which makes this claim allowable over the prior art.

The primary reason for the allowance of claim 55 is the inclusion of the limitation that the step of determining the flow rate using the flow bridge signal. It is this limitation found in the claim, as it is claimed in the combination that has not been found, taught or suggested by the prior art of record, which makes this claim allowable over the prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Contact Information

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Xiuqin Sun whose telephone number is (571)272-2280. The examiner can normally be reached on 6:30am-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Barlow can be reached on (571)272-2269. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Xiuqin Sun
Examiner
Art Unit 2863

XS
March 15, 2005

BRYAN BUI
PRIMARY EXAMINER